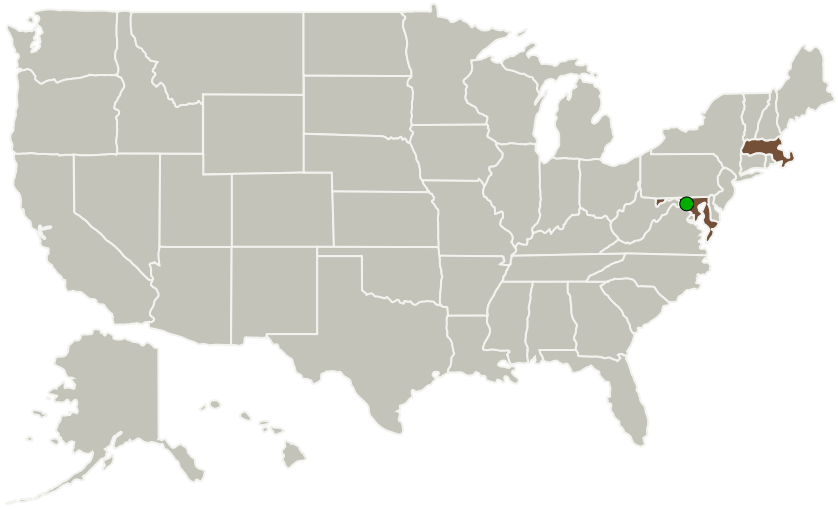
Shielded 3T HTS ADR Magnet Operating at 30-40 K, Phase I

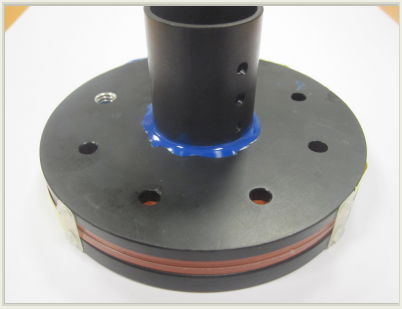
Completed Technology Project (2015 - 2016)

Project Introduction

Topic S1.10 of NASA 2015 SBIR solicitation calls for "Low current superconducting magnets (3-4 Tesla at temperatures > 15K". This proposal is a response to the technological challenge of design and manufacture of such superconducting magnets. Considering the inherent properties of high temperature superconductors (HTS), design and construction of multi-stage ADRs providing cooling from about 70K to less than 15K appears as feasible. If a multistage ADR system could reject its heat at about 30K or above, the approach of passive radiative cooling can come into serious consideration whereby mechanical cryocoolers can be totally removed from the overall cooling system. We propose to produce a comprehensive design and build a demo partially shielded 3 T HTS ADR magnet. In this project our technical objectives will be: 1. Maximizes the current density of HTS coils 2. Study and resolve quench protection and coil-to-coil quench propagation 3. Optimize the coil dimensions for maximum heat lift 4. Study the effect of the enclosing iron to find the optimum thickness of iron, and its location 5. Build and test a demo 3T HTS ADR magnet operating at 30-40 K

Primary U.S. Work Locations and Key Partners





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Organizations Performing Work	Role	Type	Location
Superconducting Systems, Inc.	Lead Organization	Industry	Billerica, Massachusetts
Goddard Space Flight Center(GSFC)	Supporting Organization	NASA Center	Greenbelt, Maryland

Primary U.S. Work Locations	
Maryland	Massachusetts

Project Transitions

June 2015: Project Start

April 2016: Closed out

Closeout Summary: Shielded 3T HTS ADR Magnet Operating at 30-40 K, Phase I Project Image

Closeout Documentation:
- Final Summary Chart Image*(https://techport.nasa.gov/file/139446)*

Images

Briefing Chart Image
Shielded 3T HTS ADR Magnet Operating at 30-40 K, Phase I *(https://techport.nasa.gov/image/133864)*

Organizational Responsibility

Responsible Mission Directorate:
Space Technology Mission Directorate (STMD)

Lead Organization:
Superconducting Systems, Inc.

Responsible Program:
Small Business Innovation Research/Small Business Tech Transfer

Project Management

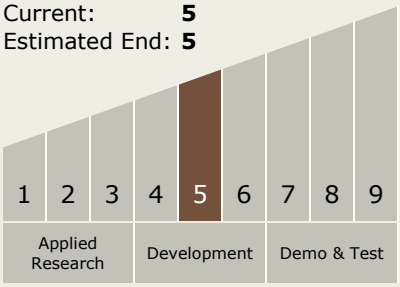
Program Director:
Jason L Kessler

Program Manager:
Carlos Torrez

Principal Investigator:
Shahin Pourrahimi

Technology Maturity (TRL)

Start: **5**
Current: **5**
Estimated End: **5**



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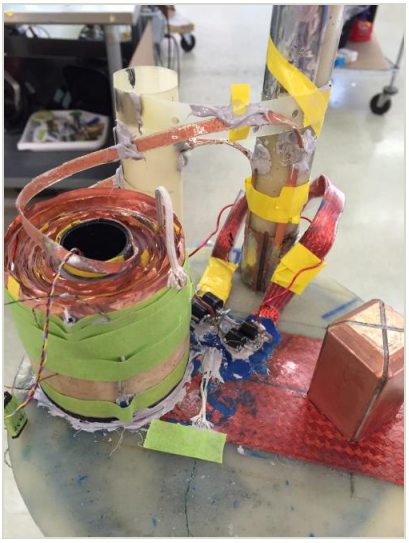

Final Summary Chart Image
Shielded 3T HTS ADR Magnet Operating at 30-40 K, Phase I Project Image
(https://techport.nasa.gov/image/130931)

Technology Areas

Primary:

- TX14 Thermal Management Systems
  - TX14.1 Cryogenic Systems
    - TX14.1.3 Thermal Conditioning for Sensors, Instruments, and High Efficiency Electric Motors

Target Destinations

The Moon, Mars, Outside the Solar System, The Sun, Earth, Others Inside the Solar System